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A Brief Review on *Chrysanthemum aphid: Macrosiphoniella sanbornii* (Gillette) and its Management

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A B S T R A C T

Floriculture in India is still in its infancy. Raising of flowers for commercial purpose is still limited to progressive gardeners around big cities. The aesthetic sense of people to decorate their home and hearth with flowers is increasing day by day. As the demand for fresh flowers is on the increase, more and more area is being brought under floriculture, ornamental trees and shrubs etc. Chrysanthemum is one of the most important crops under floriculture, having high cut flower production however, productivity and marketability are decreasing considerably due to insect pest damage, particularly by aphids causing economic loss to the growers. Hence it is imperative to know something about the aphids that attack and affect yields of chrysanthemum in brief.

Introduction

Chrysanthemum (*Dendranthema grandiflora* Borkh) gets its name from the Greek words *Chryos* – golden, *anthos* – flower, it belongs to the family Asteraceae. Chrysanthemums were cultivated in China as early as 15th century BC. The plants were used as herbs and the roots and leaves were eaten. The plant migrated to Japan several centuries later and thrived in the temperate climates of Asia. Presently 2000 varieties are grown around the world and in India about 1000 varieties are grown (Datta and Bhattacharjee, 2001). Chrysanthemum ranks second to rose among top ten cut flowers in the world trade of flower crops preferred particularly for its range of shapes and size of flower, brilliant color tones and long lasting flower life (Brahma, 2002). In India it has been recognized as one among the five commercially important flower crops (Janakiram *et al.*, 2006). Profitable production of chrysanthemum is constrained by several factors, the most important being damage caused by insect pests such as aphids, caterpillars, mites, whiteflies, thrips and leaf miner. Among these pests, chrysanthemum aphid (*Macrosiphoniella sanborni* Gillette) causes direct damage through feeding and indirectly by sooty mold formation (Agrios, 1988). The quality of these flowers is affected by many insects and diseases causing economic loss to the growers. Hence it is imperative to know something about the pests which despoil and damage these plants and methods to combat the same (Butani, 1974). In this context, to achieve satisfactory suppression of *Chrysanthemum aphids Macrosiphoniella sanbornii* (Gillette), studying their distribution w.r.t weather factors, relative incidence on different cultivars and evaluation of newer insecticides are necessary. Therefore, the available literature related to the present study has been reviewed under the following heads.

Distribution of *Chrysanthemum aphids* and effect of weather factors on incidence of *Chrysanthemum aphids*.

Relative incidence of aphids on cultivars of chrysanthemum

Efficacy of different insecticides against chrysanthemum aphid.

Distribution of *Chrysanthemum aphids* and effect of weather factors on incidence of *Chrysanthemum aphids*

The *Chrysanthemum aphid Macrosiphoniella sanbornii* (Gillette) is a wide spread pest on cultivated chrysanthemum throughout the world. It is a holocyclic species with East Asian origin (Heie, 1995). It feeds mainly on young leaves and developing flower buds and could become very abundant on them. In case of high infestation, the aphid causes significant damage which results in deformation and disturbance of flower development and it also act as vector to Vein mottle and Virus B (Blackman and Eastop, 1984). All these factors together cause significant economic damage to chrysanthemum crops by decreasing their beauty and value of cut flowers (Zahedi, 1999). Pal and Sarkar (2009) reported *Macrosiphoniella sanbornii* as the major sucking pest of chrysanthemum in hilly regions of West Bengal area by conducting field surveys.

Oetting *et al.*, (1977) reported that aphid damage could be observed throughout the year on chrysanthemum but generally they were more numerous and damage would be severe during cooler months while Soglia *et al.*, (2002) observed that the increase of temperature from 15^0 C to 30^0 C caused a significant reduction in the nymphal period of aphids from 13.5 days to 5 days. Das and Biswas (1992) studied *M. sanbornii*, a pest of chrysanthemum over four generations. There was no difference between generations, and they found that temperature, relative humidity and dew point had no effect on fecundity. Jaskiewicz *et al.*, (2001) reported that *Chrysanthemum aphid* (*Macrosiphoniella sanbornii*) acts as a vector for tomato aspermy cucumo virus (TAV) and chrysanthemum B carlavirus (CHVB).

Sadegian *et al.*, (2003) determined biological characters and reproductive rates of *Chrysanthemum aphids* on 2-4 leaved seedlings during august and September months of 1999-2000. The mean temperatures were 26.43^0 C and 25.38^0 C, respectively and relative humidity were 43.5%, 28.6%, respectively. Generation numbers, developmental time, daily fecundity, total fecundity and adult longevity in field conditions were found to be 15, 8.94, 2.71, 2.91 and 20.4, respectively.

Relative incidence of aphids on cultivars of chrysanthemum

In order to find resistance source, fifty two germplasm collections of chrysanthemums were evaluated under polyhouse conditions in pots at IIHR, Bangalore. Significant variations were recorded among the genotypes in their susceptibility to aphid. Ten collections *viz*., Anuradha, Aparjitha, Asha, Chandi, F-52, Heritage, PC-31, Rangoli, Redstone and Ushakiran were found to be resistant. Among the rest, 21 collections were moderately resistant, 16 were susceptible and 5 were highly susceptible (Ramireddy and Janakiram, 2004).

Mao *et al.,* (2013) evaluated 29 chrysanthemum varieties against susceptibility to aphids in the field. They divided cultivars into 4 grades as highly resistant (HR), moderate resistant (MR), moderate susceptible (MS) and highly susceptible (HS). The results showed that 12 cultivars were highly susceptible and 2 cultivars were highly resistant.

Saicharan *et al.,* (2017) recorded relative incidence of aphids on fifteen germplasm accessions grown at Floricultural Research station, Rajendranagar, Hyderabad at fortnight intervals. The selected cultivars included 5 yellow, 5 white and 5 red coloured chrysanthemums. Among the five cultivars which recorded highest mean aphid population PAU-B-107, Ratlam selection were white flowered, Poonam, Raichur were yellow coloured cultivars and Akitha was red flowered. Similarly the five cultivars which recorded lowest aphid population count Red gold and Priya were red flower cultivars, IIHR-6, Kadapa local were white coloured and Aparjitha was the yellow coloured cultivar, from which it can be inferred that there was no clear affinity to colour by the aphids.

Efficacy of different insecticides against chrysanthemum aphid

Hara and Matayoshi (1990) conducted a field experiment to evaluate biological control of chrysanthemum pests. No chemical pesticide was applied throughout the growing season and numerous parasitoids and predators of *Liriomyza trifolii*, *Myzus persicae* and *Peridrama soucia* were recovered but pest suppression was not up to the limits. He concluded that additional biorational or chemical methods are necessary to control the pest complex of chrysanthemum. Hincapie *et al.,* (1990) evaluated the effectivity of *V. lecanii* against *Myzus persicae* collected from chrysanthemum. Three strains of fungus were used VL-A, isolated from *M.persicae*, VL-GC isolated from *Erinnyis ello* and VL-MR from *Trialeurodes vaporarium*. VL-A caused 100% mortality compared with 37.5% from VL-GC and 30% for VL-MR. Sopp *et al.,* (1990) observed reduction in aphid population on chrysanthemum crop, when they applied blastospores of *Verticillium lecanii* by an ultra low volume electrostatically charged rotary atomizer. Helyer *et al.,* (1992) noticed integrated control of *Aphis gossypii*, *Macrosiphoniella sanborni* and thrips on chrysanthemum using *Verticillium lecanii* applied at higher humid conditions at fortnightly intervals. Helyer (1993) reported that addition of rapeseed oil (codacide oil) to the *Verticillium lecanii* formulation increased its efficiency.

Albert (1999) conducted a field experiment on chrysanthemum and he found that repeated introduction of beneficial and integration of pesticides with botanicals (Neem Azal T/s) could control pest population below optimum level and he concluded that application of beneficial and botanicals would reduce yearly consumption of chemical insecticides by about 80 percent. Koul (1999) observed the growth regulatory and antifeedant effects of purified azadirachtin and neem seed extracts on *Macrosiphum rosae* and *Macrosiphoniella sanbornii* by leaf disc choice tests and it was noted that formulated neem seed extracts was highly deterrent and growth regulatory to both species and effective concentrations to produce 50% feeding deterrence were 0.80 and 0.84 percent respectively.

Sharma *et al.,* (2000) reported that the insecticides Spark (triazophos + deltamethrin) and Malathion are equieffective and better than Dipel, Nimbecidin and Econim in controlling chrysanthemum aphid. Sudan *et al.,* (2005) found that Chrysanthemum aphid, *Macrosiphoniella sanbornii* could be successfully controlled by a combined application of *Beauveria bassiana* and imidacloprid (0.025-0.05 μg/ml). Kumar *et al.,* (2007) reported that combined formulation consisting of methanolic extract of neem (*Azadirachta indica*) and karanj (*Pongamia pinnata* Pierre) was very effective against control of *Tetranychus sp*. and *Macrosiphoniella sanbornii* on chrysanthemum.

Chavan *et al.,* (2008) revealed that both the liquid formulations of *Verticillium lecanii* irrespective of dosage tested had shown significantly higher efficacy in controlling aphids. Formulation A registered 68.23 to 89.54 percent mortality and Formulation B recorded 70.28 to 96.70 percent kill of the pest. Kimbaris *et al., (*2010) tested comparative toxicity of five essential oil vapours against chrysanthemum aphid *Macrosiphoniella sanbornii* and coccinellid predators *Coccinella septumpunctata* and *Adalia bipunctata*. It was found that not only aphids were susceptible to the essential oils but also coccinellid predators. Kathiriya and Bharpoda (2010) concluded that neem based formulations Neem Azal – F 5% EC and Econim 1% EC were better in suppressing chrysanthemum aphid population compared to other neem based formulations. Preetha *et al.,* (2012) tested bioefficacy of imidacloprid belonging to chloronicotinyl group with systemic properties against cotton aphid and the results revealed that imidacloprid 17.8 SL at the recommended dose of 25 g a.i. ha^{-1} was quite promising in reducing aphid population.

Sabir *et al.,* (2012) conducted experiments to study the efficacy of individual and integrated treatments for the management of key insect pests of chrysanthemum and results revealed that in all the tested insecticides, the integrated treatments were most effective in comparison to the individual interventions and combined treatment of phospomidon and cypermethrin was the most effective against the key pests, *viz.,* aphid and caterpillar. In chrysanthemum aphid control, the effectiveness of individual treatments of agricultural spray oil and azadirachtin were decreased immediately after two days of spraying, whereas combined treatment of both showed very effective results. Saicharan *et al.,* (2017) have observed that, among applied treatments imidacloprid was the most effective treatment in reducing aphid population by 92.31 per cent which was a significant reduction over untreated control as compared to the other treatments. The next effective treatments were Verticillium followed by azadirachtin (68.54%), two sprays of azadirachtin (68.49%) and Verticillium followed by karanj oil (67.34%) which were all significantly different from each other. Two sprays of Verticillium were found to significantly reduce aphid population over control but was least effective (64.66%) in comparison to rest of the treatments.

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